Alg. 2 Warm Up #6-1

Below are two situations that can be described using exponential functions. They represent a small sampling of the situations where quantities grow or decay by a constant percentage over equal periods of time. For each situation:

- Find an appropriate unit of time (such as days, weeks, years).
- Find the multiplier that should be used.
- Identify the initial value.
- Write an exponential equation in the form $f(x) = ab^x$ that represents the growth or decay.

1. A house purchased for $120,000 has an annual appreciation of 6%.
2. The number of bacteria present in a colony is 180 at noon, and it increases at a rate of 22% per hour.

Add to your Math Spiral:

Meanings of Square Roots:

$\sqrt{16}$ → Means: "The positive or principal square root of 16" (which is positive 4)

$-\sqrt{16}$ → Means: "The opposite of the principal square root of 16" (which is - 4)

$x^2 = 16$ "What number when squared will = 16?"

$\sqrt{x^2} = \sqrt{16}$

$\boxed{x = \pm 4}$ because $(+4)^2 = 16$ and $(-4)^2 = 16$

METHODS AND MEANINGS

MATH NOTES

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Forms of Quadratics

There are three main forms of a quadratic function: standard form, factored form, and graphing form. Study the examples below. Assume that $a \neq 0$ and that the meaning of a, b, and c are different for each form below.

Standard form: $f(x) = ax^2 + bx + c$. The y-intercept is $(0, c)$.

Factored form: $f(x) = a(x+b)(x+c)$. The x-intercepts are $(-b, 0)$ and $(-c, 0)$.

Graphing form (vertex form): $f(x) = a(x-h)^2 + k$. The vertex is (h, k).

$f(x) = a(x-p)(x-t)$

x-int: $(p,0)$ & $(t,0)$

METHODS AND MEANINGS

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Finding Graphing Form and Vertex of Parabolas

Starting with the graphing form of a quadratic equation and rewriting it to get standard form is straightforward algebra. But starting with a quadratic equation in standard form and rewriting it to get graphing form is more difficult. You have used two strategies to rewrite standard form in graphing form: **averaging the intercepts** and **completing the square.**

$y = x^2 + 6x + 8$

$0 = (x+4)(x+2)$

$x = -4, -2$

Vertex: $x = \frac{-4-2}{2}$

$(-3,-1)$

$x = -3$

$y = (-3+4)(-3+2)$

$1(-1)$

$\boxed{y = (x+3)^2 - 1}$

$y = x^2 + 6x + 8$

$y = \underbrace{x^2 + 6x + 9} \underbrace{+ 8 - 9}$

$y = (x+3)^2 - 1$

$(-3,-1)$

METHODS AND MEANINGS p.

MATH NOTES

Exponential Functions

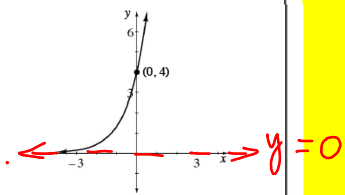
An exponential function has the general form $y = a \cdot b^x$, where a is the initial value (the y-intercept) and b is the multiplier (the growth). Be careful: The independent variable x has to be in the exponent. For example, $y = x^2$ is *not* an exponential equation, even though it has an exponent.

For example, in the multiple representations below, the y-intercept is (0, 4) and the growth factor is 3 because the y-value is increasing by multiplying by 3.

$y = 4 \cdot 3^x$

x	y
−3	$\frac{4}{3^3}$ or $\frac{4}{27}$
−2	$\frac{4}{3^2}$ or $\frac{4}{9}$
−1	$\frac{4}{3}$
0	4
1	12
2	36
3	108

×3
×3



To increase or decrease a quantity by a percentage, use the multiplier for that percentage. For example, the multiplier for an increase of 7% is 100% + 7% = 1.07. The multiplier for a decrease of 7% is 100% − 7% = 0.93.

100% − 7% = 93%
0.93

Describe transformations:

Parent

$y = x^2$

General Form

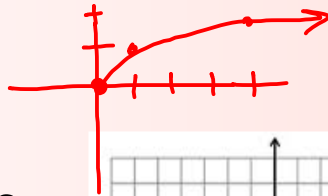
$y = a(x - h)^2 + k$

a:
- $a > 1$ vertical stretch
- $0 < a < 1$ vert. compression
- If $a < 0$, reflected in x-axis

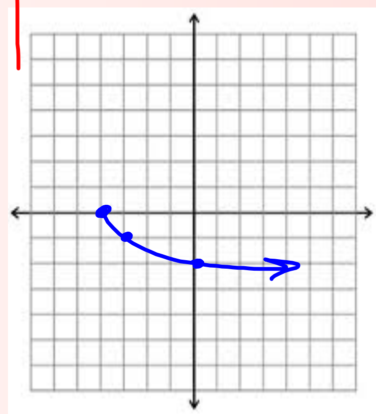
h: horizontal translation to left or right

k: vertical translation up or down

5. Transform $y = \sqrt{x}$



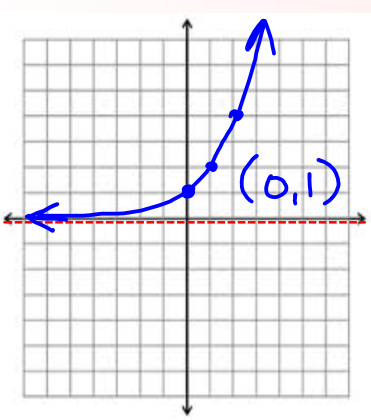
* reflect over the x-axis
* shift left 4



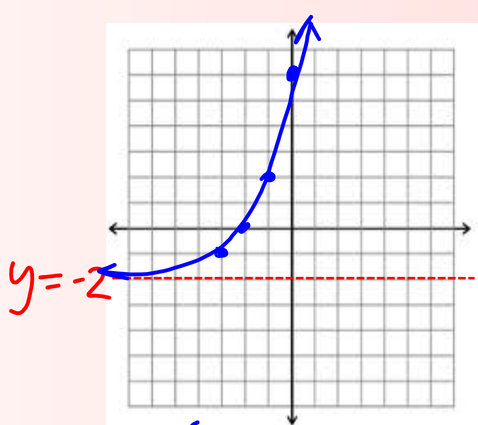
New equation:

$y = -\sqrt{x+4}$

8. $y = 2^x$



$y = 2^{(x+3)} - 2$ left 3 down 2



$y = 2^{(0+3)} - 2$

$8 - 2$

Pink CP's:

Parent	General Form
$y = x^2$	$y = a(x - h)^2 + k$
$y = x^3$	
$y = \sqrt{x}$	
$y = \frac{1}{x}$	$y = a\frac{1}{x-h} + k$

Graph is a hyperbola

HW: 2 -

81 - 86

HW: 2- # 81 ---> 86

Review & Preview

2-81. While watering her outdoor plants, Maura noticed that the water coming out of her garden hose followed a parabolic path. Thinking that she might be able to model the path of the water with an equation, she quickly took some measurements. The highest point the water reached was 8 feet, and it landed on the plants 10 feet from where she was standing. Both the nozzle of the hose and the top of the flowers were 4 feet above the ground. Help Maura write an equation that describes the path of the water from the hose to the top of her plants. What domain and range make sense for the model?